

Report on Annelids from the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum. By FRANK E. BEDDARD, M.A., F.Z.S. (Communicated by Dr. JOHN ANDERSON, F.R.S., F.L.S.)

[Read 16th June, 1887.]

(PLATE XXI.)

EUPOMPE INDICA, n. sp. (Plate XXI. figs. 1 & 3.)

A single specimen of an Annelid contained in the collection appears to belong to an undescribed species, which I would refer to the genus *Eupompe*.

It presents numerous points of agreement with *Panthalis melanotus* and with *P. nigromaculata*, already known through Grube's researches* to inhabit the shores of the Philippine Islands; it agrees, in fact, with those two species rather more closely than with *Eupompe Grubei*, the only described† species of its own genus.

A careful study of this species and of the description of other species published by Kinberg‡ and Grube§ has convinced me that there are no grounds for distinguishing the genera *Eupompe* and *Panthalis*; and as the former name appears first in his descriptions, I retain it as having the priority.

In comparing Kinberg's diagnoses of the genera *Eupompe* and *Panthalis* (which I need not quote in full), I find that the only points of difference concern the protrusible pharynx and the arrangement of the elytra. The diagnosis of *Panthalis* contains a statement with respect to the ventral cirri which is not found in the diagnosis of *Eupompe*. A comparison of the figures of these structures, however (*loc. cit.* pl. vii. figs. 34 F, 35 F, and 34 F', 35 F'), shows that there is hardly sufficient difference in their shape and position whereon to found a specific, let alone a generic, distinction. The elytra in *Eupompe* are flat, not meeting in the dorsal middle line anteriorly, but covering the dorsal surface posteriorly; the elytra in *Panthalis* are described as being numerous, the anterior series flat, the posterior bell-shaped; the first

* "Beiträge zur Kenntniss der Annelidenfauna der Philippinen," Mém. d. l'Acad. Imp. Sci. St. Pétersbourg, t. xxv. (sér. 7), 1878, p. 48.

† Kinberg, 'Kongl. Svensk. Fregatten Eugénies Resa,' Annulata, p. 24.

‡ *Loc. cit.*

§ *Loc. cit.*

few anterior elytra meet in the middle dorsal line, the rest leave the dorsal surface uncovered in the middle line.

With regard to the shape of the elytra, Grube finds that in *P. melanonotus* some are bell-shaped*; and that therefore this generic distinction must fall to the ground.

This species (*P. melanonotus*) agrees with Kinberg's definition of the genus in so far that a few of the anterior pairs of elytra meet in the middle dorsal line, while the remainder do not. Not so, however, *P. nigromaculata*. In this species the anterior elytra do not meet in the middle dorsal line, while the posterior do, as in *Eupompe*. The Mergui species is a connecting-link between the extremes; the three anterior pairs of elytra, as well as a large number of the posterior pairs, do meet in the middle dorsal line, while the elytra of intermediate position do not. It is clear, therefore, that the arrangement of the elytra is only of value as a specific distinction.

The only remaining generic distinction† is the pharynx. Grube says nothing about this, probably for the same reason as myself, being unwilling to injure the only example of the species contained in Dr. Anderson's collection.

Even if the differences in the pharynx of the type species of the genera described by Kinberg are found also in other species, it appears to be largely a question of opinion and of authority whether the difference is sufficient to constitute a generic distinction. In my own opinion the comparatively slight modifications in an organ, which often undergoes such variations in closely allied species, as in the case of *Nereis*, cannot be considered of sufficient importance to warrant a generic separation.

The specimen measures about 110 millim. in height; it is of an elongated form, only slightly narrowed towards the posterior extremity. The colour is of a yellowish brown; the elytra are coloured of a rich brown, which is rather more conspicuous on the inner side. The dorsal side of the body, as in other species, is covered with closely-set wrinkles, which render it impossible to map the segments in this region; on the ventral side the intersegmental furrows are obvious.

The dorsal surface is marked by a median longitudinal dark

* *Loc. cit.* p. 49.

† The difference between the setæ is not referred to in the generic definition, and can hardly be regarded as of generic importance.

stripe, which corresponds to the dorsal blood-vessel; posteriorly this lies in a groove; on each side of the groove the integument is thickened, and of the yellowish-brown colour which produces the distinctive appearance of the worm; beyond this the body is translucent and colourless, the thickened area is wider anteriorly and is somewhat diminished in width posteriorly; where the elytra do not meet in the middle line, it corresponds more or less accurately to the bare space left by the elytra.

The ventral side of the body is also marked by a conspicuous longitudinal groove; this commences at the 8th segment, where it is considerably wider and occupied by a median elevation, which reaches back about as far as the 30th segment, and gradually dies away.

The disposition of the elytra has been already referred to; they alternate regularly with cirri throughout the body, except on the fourth and fifth segments, which are both provided with elytra and not cirri.

The dorsal cirri are attached, as in other species, by a swollen base; both dorsal and ventral cirri are short.

The setæ appear to me to differ but little from those of *Eupompe Grubei* (Kinberg, *loc. cit.* pl. vii. fig. 35 G).

The head is illustrated in Pl. XXI. figs. 1 and 3, and is entirely characteristic. It may be noted that the cephalic lobe bears two eye-spots (*e'*) in addition to the two large eyes (*e*).

CHLOEIA MERGUIENSIS, n. sp. (Plate XXI. figs. 2, 8, & 9.)

The largest specimen of this Annelid measured 54 millim. in length, the greatest breadth being 10 millim.

The shape of the body is not ovoid, but elongate; this appearance is at any rate presented by the worm when the setæ have been for the most part removed.

The dorsal side of the body is covered with innumerable grooves, and presents a tessellated appearance; the areas bounded by the grooves are of an elongated rhomboidal shape, their long axis coinciding with the long axis of the body; the skin covering the parapodial outgrowths is for the most part smooth. Each segment is divided by two rather more conspicuous grooves into three divisions; the middle one is wider anteriorly than posteriorly, since the grooves fall obliquely and tend to approximate posteriorly; the lateral divisions bear the parapodia and the branchiæ which are just outside the grooves; the median area is marked

by a transverse zigzag groove, which is caused by the regular arrangement in this region of the rhomboidal areas of the skin.

The dorsal surface of the body is also marked by patches of pigment which have a regular and characteristic arrangement; each segment has a median stripe which widens out anteriorly into a triangular patch; the transverse furrow marks the junction between the triangular patch and the narrow stripe; posteriorly two curved pigment-bands pass one on each side along the furrow separating the dorsal from the lateral portions of the segment. The whole pigmented area has, as Horst has remarked in the case of *Chloeia parva**, a marked resemblance in shape to an anchor. Each segment has also a broad pigmented band on the anterior side of the parapodial outgrowth; in the anterior segments of the body this latter band is continuous with the curved lateral pigmented bands; in these segments also there is a short pigmented streak behind the parapodial outgrowths; in the posterior segments this streak gradually dies away.

The ventral surface of the body is comparatively smooth, with the exception of a few of the anterior segments which bound the mouth; these are much wrinkled by longitudinal furrows; the third and fourth segments of the body are fused in the middle ventral line into a rounded projection which bounds the mouth posteriorly; this process is greatly furrowed; the middle ventral line of the body is marked by a distinct and rather transparent line which corresponds to the nerve-cord.

The caruncle extends back as far as the fourth segment, but its posterior end is free, and it is not attached to this segment nor to much of the third; the caruncle bears a longitudinal pigmented stripe.

The setæ are much more abundant in the neuropodium than in the notopodium; they are of considerable length in the former, and have everywhere a white silky appearance.

The dorsal setæ (fig. 2) are all of one kind; they are stout, and serrated at the free extremity. The general aspect of these setæ is in fact closely similar to that of other species. The extreme tip of the seta is often of a yellow colour, and slightly serrated on the margin which bears the lateral teeth before the commencement of the latter; below the lateral serrations and on

* 'Notes from the Leyden Museum,' vol. viii, p. 168.

the opposite side of the seta there is a short slender tooth-like process directed forwards; this is only found in the setæ of the anterior segments; in the setæ of the posterior segments its place is indicated by a swelling. The imbedded extremity of these setæ is sharply pointed. A large portion of the shaft is marked by faint constrictions, which give it a transversely striate appearance in the posterior setæ.

The ventral setæ are long and slender, and bifid at their extremity, one limb of the bifurcation being shorter than the other.

The branchiæ commence at the fourth segment, and gradually increase in size in the posterior segments. Their shape is precisely as described by Prof. M'Intosh in *Chloëia flava**. To describe the branchiæ of *C. merquiensis* would be merely to recapitulate Prof. M'Intosh's description. The colour of the branchiæ is the same as that of the general body-surface; the main stem is slightly pigmented.

The first pair of branchiæ, *i. e.* those borne by the fourth segment, were in a rudimentary condition as compared with those which follow; the main branches of the stem were either devoid of secondary branches, or were furnished with only one or two at the base. The complexity of these organs appears to increase in the first few segments.

The dorsal cirri are deeply pigmented and of considerable length, especially on the middle and posterior segments; the anterior segments appear to bear an additional minute cirrus in place of the missing branchiæ, as is mentioned by Prof. M'Intosh in *C. flava*; this second cirrus is not pigmented.

The ventral cirri are not so long as the dorsal and are unpigmented.

The anal cirri are short and thick, unpigmented.

The anus is dorsal in position.

This species is plainly distinguishable from *Chloëia flava* by the colour and shape of the setæ, the spur of the dorsal setæ being much more evident than in the present species. Furthermore, the pigmentation of the body in the two species is quite different.

It is not so easy, however, to distinguish the present species from *C. parva*, and accordingly I distinguish it from that species with a certain amount of doubt.

* Report on the Annelids collected during the Voyage of H.M.S. 'Challenger,' Zool. Chall. Exp. vol. xii. (part xxxiv.).

The distribution of pigment on the body agrees very closely with Baird's, and particularly with Horst's, description. On the other hand, Baird's description of the branchiæ as being "small, simply branched, and . . . of a dark colour," hardly confirms what has been said above respecting the exact resemblance between the branchiæ of my species and of *C. flava*.

The character of the dorsal setæ as described by Horst is the chief obstacle to my definitely regarding the Mergui specimens as belonging to the species *C. parva*. In the first place, I could observe no such difference between the shaft and the tip of the seta as he describes. It is true that the shaft has usually a somewhat fibrous appearance, while the tip is more transparent; but I could observe no abrupt line of demarcation. In the second place, the presence of a small spur does not coincide, in the anterior bristles, with the want of serration.

EURYTHOË ALCYONIA, *Savigny*.

Pleione alcyonia, *Savigny, Système des Annelides*, p. 62.

This species has been carefully described in Horst's memoir already quoted. I have examined a large number of specimens, which agree closely with Horst's description except as regards the *colour* of the setæ.

I find in my specimens the great variety in the characters of the setæ of the dorsal and ventral parapodia as described by Horst. The second kind of setæ described by him, those with a "slightly bifid tip, one of the divisions being a mere spur, while the other is extremely elongated and tapering," are of a horny-yellow colour throughout the whole of the distal region. The other setæ have a colourless extremity. Horst's description states the exact converse. If this is not an accidental error in his description, the variation in the colour is curious and worth noticing.

I did not observe any "hastate" setæ in the notopodium; but they are present in the neuropodium in my specimens: I could not find more than one in each segment, and they were deeply imbedded in the soft tissue, the spear-like extremity alone protruding. These setæ are stout.

BRANCHIOMMA INTERMEDIUM, n. sp. (Plate XXI. figs. 4-7.)

The collection contained two specimens of this species, one of which only was perfect, and measured about 100 millim. in length, including the branchiæ. There were also a number of fragments,

of various sizes, of the tubes of the worm; these are of considerable thickness, the greater portion being formed by a coating of fine mud and sand, in which is imbedded a quantity of entire and broken shells of various kinds; the part of the tube fabricated by the animal itself is thin, and of a tough, somewhat cartilaginous consistency. The colour of both specimens is a pale brown, the branchiæ being somewhat darker, but still of a uniform brown tint. The anterior region of the buccal segment (fig. 4) is marked by a broad black band, and the two halves of the collar where they meet in the median ventral line (fig. 5) are similarly pigmented.

The collar, instead of being confined to the first segment, passes obliquely downwards, and terminates on the third seta-bearing segment; on all the segments the collar is situated on the dorsal side of the parapodia and close to them. The relations of the collar can be seen by an inspection of figs. 4 and 5.

The "thorax" contains eight segments, which are distinguished from the abdominal segments by the much larger size of the *tori uncinigeri*. The middle ventral line of each of the thoracic segments is marked by a thickened lighter-coloured area, which extends over the greater part of the ventral surface; this area gets smaller in the posterior segments, and in the abdominal region is bisected by the ventral groove. The latter occupies the median ventral line up to the eleventh segment; on the tenth segment it is bent towards the right side, and, after crossing between the eighth and ninth, reaches the dorsal median line at the sixth segment. On the dorsal side of the body this groove runs at the bottom of a rather deep depression which marks these segments.

The setæ of the dorsal *tori uncinigeri* are of two kinds, as in other species of this genus, and show no peculiarities in their shape. They are stout setæ with a double curvature at the extremity, which becomes gradually attenuated towards the tip. These parapodia also bear rounded mamillary processes, possibly of a sensory nature, which appear to resemble those figured by Claparède in *Trophonia eruca* *. I do not find any such process on the corresponding region of the parapodium in the abdomen, although the surface is irregularly divided into rounded prominences.

* "Annélides chétopodes du Golfe de Naples," Mém. Soc. Phys. Gen. t. xx. pl. xxv. fig. 2.

The branchial filaments are furnished at their tips with well-developed eyes, a single eye to each branchial filament.

In the relation of these eyes to the extremity of the branchial filament, the present species is particularly like *Branchiomma vigilans**; that is to say, that the terminal region of the branchial filament is prolonged for a considerable distance beyond the eye, which is attached to its under surface.

The eye of *B. intermedium*, however, appears to differ a little in shape from the last-named species as well as from the others; it is somewhat mushroom-shaped (Pl. XXI. fig. 6); the stalk of attachment to the branchial filament is pigmented.

An interesting point about the branchiæ of this species is illustrated in the same figure; towards the extremity is a double fold just overlying the eye; the two halves of this fold appear to coalesce (figs. 6 and 7) posteriorly, and gradually to die away towards the base of the branchial filament. It seems to me permissible to compare this structure to the dorsal filaments on the branchiæ of *Dasychone*, and on that account I have named this species "*intermedium*." This character does not seem to occur in other species—it has not, at any rate, been figured or referred to—and therefore will serve to distinguish the present species.

Another species which, coming from the same quarter of the globe, will be confounded with this, is *Sabella acrophthalmos* of Grube†. Grube, however, says nothing about the dorsal laminae upon the branchial filaments, and compares the species generally with *Branchiomma vesiculosum*. I apprehend, therefore, that the relation of the eyes to the gill-filaments is more like that of *B. vesiculosum* than *B. vigilans*.

There are two tentacles about one third of the length of the branchial filaments; each tentacle is slightly curved, and tapers gradually towards its free extremity, which bears a certain amount of pigment on the inner side; the inner (curved) edge of the tentacle bears a number of extremely delicate hair-like filaments.

DASYCHONE SERRATIBRANCHIS, Grube.

Dasychone serratibranchis, Grube, *Beiträge für Annelidenfauna etc.* p. 262.

The collection contains several specimens of a *Dasychone* which I refer to this species.

* *Loc. cit.* p. 501.

† *Loc. cit.* p. 258.

On the Structure of the Eyes in Chloëia merguensis.

So far as I am aware, there is no description of the minute structure of the eyes in *Chloëia*, or, indeed, in any of the Amphinomidæ. The excellent state of preservation of the specimens of *Chloëia merguensis* has enabled me to contribute some observations on the eyes of this species to what is already known of the structure of the Annelid eye. This worm possesses, in common with other Amphinomidæ, two pairs of eyes situated one in front of the other; these are recognizable to the naked eye as four black spots upon the procephalic lobe.

The first point to which I directed my attention was to ascertain whether or not there was any difference in structure between the anterior and posterior pairs, as there is, for example, between the eyes of *Nereis cultrifera**. I did not, however, detect any differences of a similar nature, or of any kind whatsoever between the eyes of either pair †.

The following description, with the reservation stated in the footnote, applies to both pairs.

The retina (fig. 8, *r*) consists of a single row of tall narrow cells, as in other Annelids, which terminate in long rods (*n*), the structure of which, owing to their excessive slenderness, I am unable to describe. The retinal cells are for the most part rather longer than their rods; and appear to be all deeply pigmented, the colour of the pigment being black. Curiously enough, a small region of the retina on one side of the eye has an orange-coloured pigment deposited in the retinal cells; this is evidently not an accidental variation, as I found that in all four eyes of the single specimen, which I examined microscopically, the same region of the eye presented an exactly similar condition of the retinal pigment.

The cells of the retinal layer are not, however, equally pigmented throughout. The pigmented area is about half the extent of the retinal area, the lower half of these cells being entirely free from pigment; the pigment also appeared to be largely extrinsic, though a portion of it is certainly intrinsic, *i. e.* within the substance of the retinal cells. It is therefore probable that there is in *Chloëia* a resemblance to *Nereis*, in which Annelid Carrière

* Carrière, 'Die Sehorgane der Thiere,' München u. Leipzig, 1885, p. 31.

† I should state, however, that I did not observe very clearly the relations of the lens in the first pair.

has figured* and described two kinds of retinal cells: (1) pigmented cells pigmented throughout their whole length, and (2) clear cells entirely free from pigment. The very small size of the pigmented cells causes the eye of *Chloëia* to resemble more nearly that of the Alciopidæ (presuming that the pigment-layer is really contained in separate cells in the Alciopidæ); *Chloëia* is, in fact, in this particular intermediate between *Nereis* and the Alciopidæ.

Carrière did not find, or at least does not figure, any rods attached to the extremity of the retinal cells in *Nereis*; the whole of the interior of the eye is filled with a plug of tissue termed by him the vitreous body (*Gallertkörper*). Patten † suggests, with apparent reason, that part of this, at any rate, is in all probability composed of a layer of rods. If this is not the case, the eye of *Nereis* differs in a very striking fashion from the eye of *Chloëia* and the Alciopidæ ‡. The retinal layer is continuous anteriorly with a delicate layer of cells, the eye being therefore, as in other Annelids, a closed sac. There is not, however, a space left in the eye between the retinal layer and the vitreous layer; the whole of the available space is occupied by a lens which has rather a peculiar shape, as shown in fig. 8 of Plate XXI.; this lens is deeply stained by borax carmine. In that particular, and in its laminated structure, it agrees exactly with the cuticle which covers the eye externally; the structure of the lens, in fact, appears to be closely similar to that of the Alciopidæ §, and to differ from that of *Nereis*. In the Alciopidæ a considerable space is left between the lens and the extremities of the rods; there is no such space in *Chloëia*, the lens being nearly in contact with the rods (Pl. XXI. fig. 6): in this particular, therefore, it resembles the lens of *Nereis*.

An important feature in the eye of Chloëia is the continuity of the cuticle and the lens. A careful examination of consecutive sections showed plainly that there is no break whatever between the cuticle, which covers the eye externally, and the lens; the latter appears to be simply a thickening of the former. I am not disposed to deny that the connection between the lens and

* *Loc. cit.* p. 31 *et seq.*

† Greeff, "Untersuchungen über die Alciopiden," *Nov. Act. Acad. Leopold.-Carol.* Bd. xxxix. (1876).

‡ *Mitth. a. d. Zool. Stat. zu Neapel*, Bd. vi. (1886), p. 701.

§ Greeff, *loc. cit.*

the outer cuticle may not be a secondary fusion, analogous, therefore, to the fusion of cuticle and vitreous body in *Elater*, *Lampyrus*, &c. described by Grenacher*. The condition of the eye in certain Alciopidæ, for example in *Nauphanta celox*†, where the hypodermis and vitreous layer intervening between the cuticle and lens has become extremely rudimentary, suggests that this is the case. On the other hand, the resemblance to what Profs. Lankester and Bourne‡ would term (if it were an Arthropod eye) a monomeniscous diplostichous non-reticulate eye is not a little striking.

DESCRIPTION OF PLATE XXI.

- Fig. 1. *Eupompe indica*, n. sp. Anterior segments. *e*, eye; *e'*, eye-spots.
 2. Dorsal seta of *Chloeia merguensis*, n. sp.
 3. Side view of head of *Eupompe indica*, n. sp.; *e*, eye.
 4, 5. *Branchiomma intermedium*, n. sp.
 6. Tentacle of ditto, viewed laterally.
 7. Transverse section of ditto.
 8. Eye of *Chloeia merguensis*, n. sp. *r*, retina; *n*, rods; *e*, hypodermis; *l*, vitreous body (?).
 9. Base of retinal rods, viewed in transverse section.

* Grenacher, 'Untersuchungen über das Sehorgan der Arthropoden.'

† Greeff, *loc. cit.* p. 69, pl. v. fig. 43.

‡ Q. J. M. S. vol. xxiii. (1883), p. 210.

